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Hence

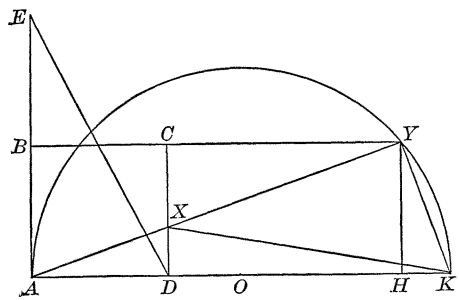
$$AX = YK. \tag{1}$$

Now

$$\overline{XY}^2 + \overline{YK}^2 = \overline{XK}^2 = \overline{XD}^2 + \overline{DK}^2 = \overline{XD}^2 + \overline{DE}^2 \text{ (by constn.)} \tag{2}$$

$$= \overline{XD}^2 + \overline{AD}^2 + \overline{AE}^2 = \overline{AX}^2 + \overline{AE}^2 = \overline{YK}^2 + \overline{AE}^2, \text{ by (1).}$$

Hence, $\overline{XY}^2 = \overline{AE}^2$ and, therefore, $XY = AE =$ the given length.



Also solved by J. Scheffer whose conclusion agrees with that of Professor Shively published in the April number.

H. C. Feemster sent in a solution of 409 too late for notice in April number.

MECHANICS.

250. Proposed by C. N. SCHMALL, New York City.

A smooth circular table in surrounded by a smooth vertical rim. A ball of elasticity e is projected from a point at the rim in a line making an angle θ with the radius through that point. Show that the ball will return to the starting point after the second impact if

$$\tan\theta = \sqrt{\frac{e^3}{e^2 + e + 1}}.$$

SOLUTION BY THE PROPOSER.

Let ABC be the path of the ball and O the center of the table. Let the angles OAB, OBC, be θ, ϕ respectively. Then OBA and OCB are also θ, ϕ, respectively. Let OCA be ψ. Then if the ball returns to A after the second impact the angle CAO will also be ψ. The angles θ, ϕ, ψ, are the angles which the path of the ball makes with the radii passing through it initially and after the first and second impacts. We then have, by elementary principles of impact,

$$\cot\phi = e\cot\theta, \tag{1}$$

$$\cot\psi = e\cot\phi = e^2\cot\theta. \tag{2}$$

But $\theta + \phi + \psi = \pi/2$. Hence $\cot(\theta + \phi + \psi) = 0$.

That is,

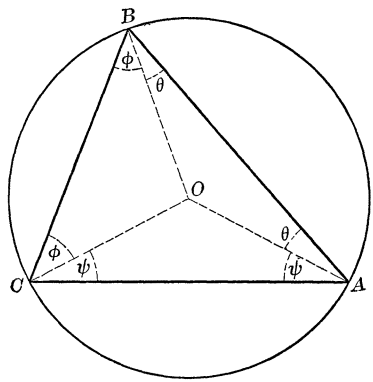
$$\frac{\cot\theta\cot\phi\cot\psi - \cot\theta - \cot\phi - \cot\psi}{\cot\theta\cot\phi + \cot\phi\cot\psi + \cot\psi\cot\theta - 1} = 0.$$

Hence $\cot\theta \cot\phi \cot\psi = \cot\theta + \cot\phi + \cot\psi$, and by (1) and (2),

$$e^3 \cot^3\theta = \cot\theta\,(1 + e + e^2),$$

or,

$$\tan^2\theta = \frac{e^3}{e^2 + e + 1} \qquad \text{and} \qquad \tan\theta = \sqrt{\frac{e^3}{e^2 + e + 1}}.$$



NOTES AND NEWS.

MR. G. W. SMITH, of the University of Colorado, has been appointed assistant in mathematics at the University of Illinois.

DR. B. F. FINKEL, of Drury College, will have charge of the mathematics in the 1913 summer school of the University of Colorado.

The MONTHLY will not be published during the months of July and August. The next issue will appear early in September.

The April number of *The Monist* contains an article by the late HENRY POINCARÉ on "The Relativity of Space."

The first two articles in the latest number of the *Bibliotheca Mathematica* (May 6, 1913) are by PROFESSOR L. C. KARPINSKI. Their titles are as follows: "Hindu numerals among the Arabs," and "The Quadripartitum numerorum of Johannes de Muris."

MR. G. W. HESS, now fellow in mathematics at the University of Michigan, has accepted a call to Shurtleff College, Alton, Illinois, as head of the department of mathematics.

MR. DAVID M. SMITH and MR. DAVID L. STAMY, graduate students at the University of Chicago, have been appointed instructors in mathematics at the Georgia School of Technology, Atlanta, Ga.

The following candidates for the doctorate in mathematics at the University of Chicago have been appointed to University instructorships: MISS MILDRED L.